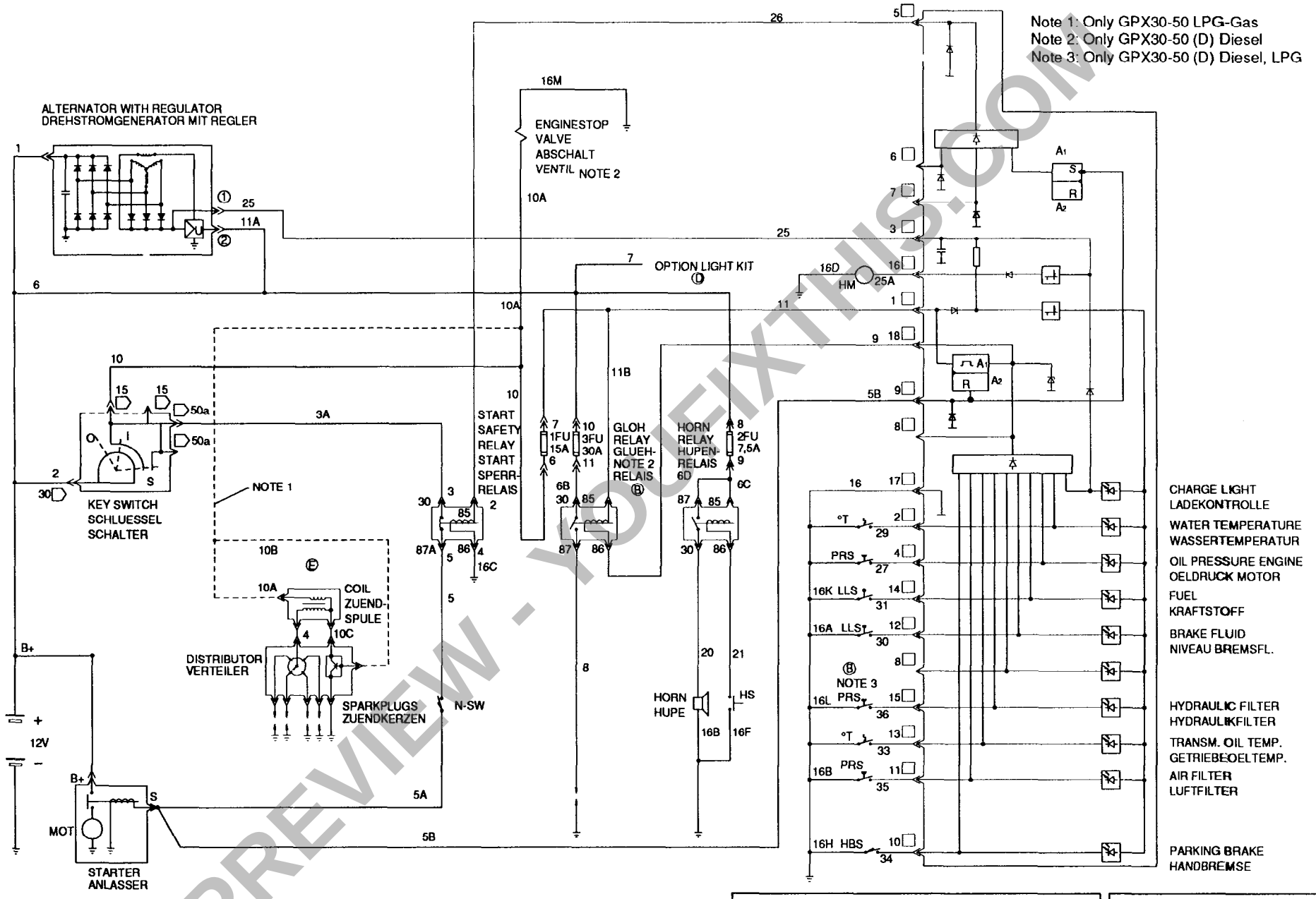


EFFECTIVITY LEVEL/CHANGE # / DATE	
E	COIL CHANGED • GEF920209 • 30SEP92 • FK /KHL
D	OPTION LIGHT KIT • GEF920209 • 30SEP92 • FK /KHL
C	GEF920117 WAS GEF920113 • GEF920160 • 24JUL92 • FK /KHL
B	NOTES ADDED • GEF920117 • 26JUN92 • FK /KHL
A	RELEASED • GEF920084 • 22MAY92 • FK /KHL

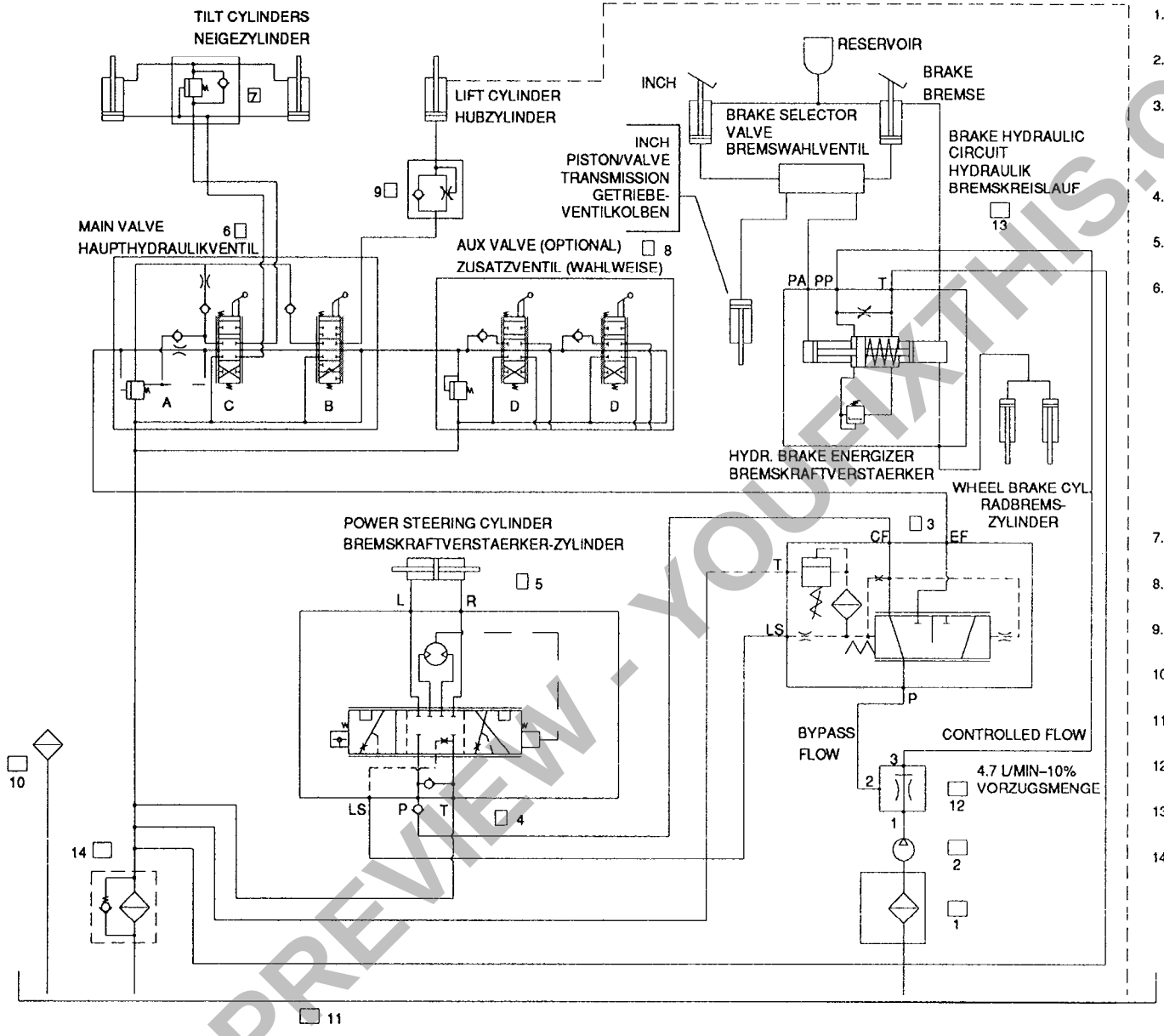
WIRING DIAGRAM (STROMLAUFPLAN)

GPX30/50 D/LPG/GAS

22MAY92 **4320812**

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MAIN HYDRAULIC SYSTEM
HAUPTHYDRAULIKSYSTEM

1. SUCTION SCREEN
   SAUGSIEP
2. HYDRAULIC PUMP
   HYDRAULIKPUMPE
3. PRIORITY DEMAND VALVE WITH PRESSURE RELIEF VALVE FOR STEERING
   VORZUGSMENGENTEILER MIT DRUCKBEGRENZUGSVENTIL FUER LENKUNG
4. POWER STEERING VALVE
   BREMSKRAFTVERSTAERKER-VENTIL
5. POWER STEERING CYLINDER
   BREMSKRAFTVERSTAERKER-ZYLINDER
6. *MAIN HYDRAULIC VALVE WITH:*
   - A. PRESSURE RELIEF VALVE
   - B. LIFT LOWERING SPOOL WITH LOAD CHECK
   - C: TILT SPOOL WITH COUNTERBALANCE VALVE
   - D: AUXILIARY SPOOLS

   HAJPTHYDRAULIKVENTIL MIT:
   - A: DRUCKBEGRENZUNGSVENTIL
   - B: HEBEN/SENKEN- SCHIEBER MIT LASTBREMSE
   - C: NEIGE-SCHIEBER MIT AUSGLEICHSVENTIL
   - D: ZUSATHYDRAULIK-SCHIEBER
7. COUNTERBALANCE VALVE
   AUSGLEICHSVENTIL
8. AUX VALVE
   ZUSATZVENTIL
9. LOWERING FLOW VALVE
   SENKBREMSVENTIL
10. BREATHER FILTER
    ENTLUEFTUNGSFILTER
11. HYDRAULIC TANK
    HYDRAULIK TANK
12. PRIORITY DEMAND VALVE FOR BRAKING
    VORZUGSMENGENTEILER FUER BREMSSYSTEM
13. BRAKE CIRCUIT
    BREMSKEIS
14. RETURN LINE FILTER
    RUECKLAUFFILTER

EFFECTIVITY LEVEL/CHANGE # / DATE	
B	REVISED•REDRAWN•GEF930023•09.02.93
A	RELEASED•GEF920308•18DEC92•WA/...

DIAGRAM - CIRCUIT
HYDRAULIC
(HYDRAULIK-DIAGRAMM)
GPX/GCX 30-50
18DEC92 **IN-23319**

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Recommended torque tensions

The torque tensions below apply to components lubricated lightly with clean engine oil before they are fitted.

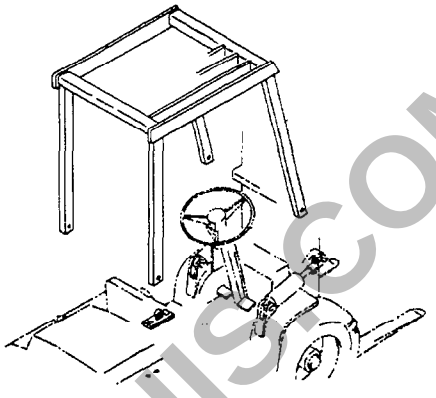
Description	Thread size	Torque		
		Nm	lbf ft	kgf m
Cylinder head assembly				
Setscrews, cylinder head	1/2 UNF	See	section	12
Fasteners, rocker shaft brackets:				
- Aluminium bracket	M12	40	30	4,1
- Cast iron bracket	M12	75	55	7,6
Cap nuts, rocker cover	M12	20	15	2,1
Cap nuts, rocker cover (with shim washer)	M12	30	22	3,0
Setscrews, inlet manifold to cylinder head	M10	44	32	4,5
Nuts (plated), exhaust manifold to cylinder head	M10	44	32	4,5
Nuts (non-plated), exhaust manifold to cylinder head	M10	50	37	5,1
Piston and connecting rod assemblies				
Nuts, connecting rods	1/2 UNF	125	92	12,7
Setscrews, connecting rods	1/2 UNF	155	114	15,8
Banjo bolts, piston cooling jets	3/8 UNF	27	20	2,8
Crankshaft assembly				
Setscrews, main bearings	5/8 UNF	265	196	27,0
Setscrews, crankshaft pulley	7/16 UNF	115	85	11,8
Cap screws, damper to crankshaft pulley	M8	35	26	3,6
Setscrews, rear oil seal housing to cylinder block	M8	22	16	2,2
Cap screws, rear oil seal housing to bridge piece	M8	18	13	1,9
Cap screws, rear oil seal housing to bridge piece	M6	13	10	1,3
Setscrew, idler gear hub of balancer unit	M12	93	68	9,5
Nut, drive gear of balance weight	1/2 UNF	82	60	8,4
Setscrews, rear cover of balancer frame	M10	54	40	5,5
Setscrews, oil transfer plate	M10	30	22	3,1
Setscrews, oil pump to balancer frame	M8	22	16	2,2
Setscrews, balancer to cylinder block	M10	54	40	5,5
Timing case and drive assembly				
Setscrews, timing case to cylinder block	M8	22	16	2,2
	M10	44	33	4,5
Setscrews, hub of idler gear	M10	44	33	4,5
Setscrew, camshaft gear	M12	78	58	8,0
Setscrews, timing case cover to timing case	M8	22	16	2,2
Nuts, timing case cover to timing case	M8	22	16	2,2
Cylinder block				
Setscrews, fitted instead of piston cooling jets	3/8 UNF	27	20	2,8
Aspiration system				
Nuts, turbocharger to manifold	M10	44	33	4,5
Lubrication system				
Plug, lubricating oil sump	3/4 UNF	34	25	3,5
Setscrews, oil pump to front bearing cap	M8	22	16	2,2
Setscrews, cover for oil pump	M8	28	21	2,9
Fasteners, lubricating oil sump	M8	22	16	2,2

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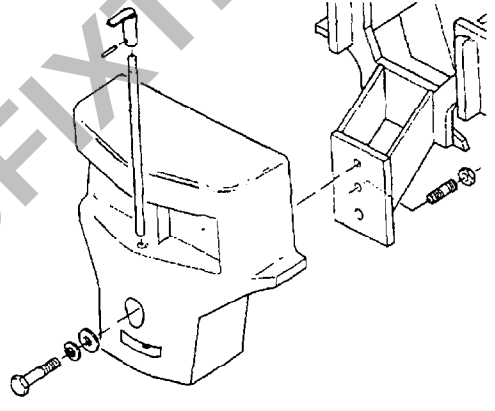
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Engine Removal

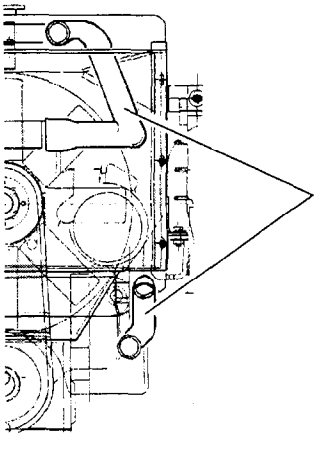
The following procedures describe the steps necessary to remove the engine. A hoist capable of lifting the overhead guard, counterweight, and engine is required.



1. Remove the overhead guard.
2. Remove the driver's seat and any electrical wires mounted to the seat support.
3. Remove the clamshell hood.



4. Remove counterweight. See the procedures for removing the counterweight in Group 38.
5. Disconnect battery leads at battery and remove the battery. Disconnect horn wires.
6. Remove floor plates. Remove top and side body sheet metal.



7. Drain radiator and remove radiator hoses to engine and to filler neck bracket.

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Section 1. Troubleshooting

CONDITION	POSSIBLE CAUSE	SUGGESTED CORRECTION
Temperature light comes on frequently.	1. Transmission cooler or lines blocked. 2. Transmission cooler defective.	1. Check cooler and lines for blockage. Flush cooler and lines. If problem not corrected, replace cooler or defective lines. 2. Replace transmission cooler. Flush system.
Transmission fluid loss (no signs).	1. Transmission oil cooler portion of radiator leaking into cooling system.	1. Check engine coolant for transmission fluid contamination. Repair or replace cooler.
Rough idle (engine misfiring).	1. Coolant temperature below normal due to incorrect or defective thermostat.	1. Replace thermostat.
Excessive blue/white exhaust smoke.	1. Coolant temperature below normal due to incorrect or defective thermostat.	1. Replace thermostat.
Engine overheating.	1. Low coolant level. 2. Radiator pressure cap defective. 3. Inadequate air flow to radiator. 4. Radiator fins plugged. 5. Radiator clogged. 6. Scale or deposits in cooling system. 7. Radiator defective. 8. Thermostat incorrect or defective. 9. Collapsed radiator hose(s). 10. Water pump defective.	1. Check coolant. Fill as required. Check for leaks. 2. Replace radiator pressure cap. 3. Check operation of fan. If defective, replace fan. 4. Blow debris from radiator fins. 5. Drain and flush radiator. 6. Drain and flush cooling system. 7. Repair or replace radiator. 8. Replace thermostat. 9. Replace hose(s). 10. Replace water pump.
Engine lubricating oil loss.	1. Oil cooler core leaking.	1. Check for oil in coolant. If found, check and replace oil cooler core.

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Capacities

Models	At 500 mm Load Center	At 24 inch Load Center
GPX 30	3000 kg	6000 lb
GPX 35	3500 kg	7000 lb
GPX S40	4000 kg	8000 lb
GPX 40	4000 kg	8000 lb
GPX 50	5000 kg	10,000 lb

Service Weights

Approximate, with preferred uprights (without load) less any attachment (optional).
Note: Refer to the Truck Data Plate for exact Service and Axle Weights.

	Standard Upright (mfh=3120 mm [125 in])	Triple Stage Upright (mfh=3885 mm [153 in])
GPX35	5135 kg (11,297 lb)	5310 kg (11,682 lb)
GPX 35	5445 kg (11,979 lb)	5620 kg (21,124 lb)
GPX S40	5735 kg (12,617 lb)	5910 kg (13,002 lb)
GPX 40	5805 kg (12,771 lb)	5980 kg (13,156 lb)
GPX 50	6740 kg (14,828 lb)	6980 kg (15,356 lb)

Axle Weights

Without load and with preferred uprights, less any attachment (optional).

		Standard Upright	Triple Stage Upright
GPX30	Drive Axle	2650 kg (5830 lb)	2875 kg (6325 lb)
	Steer Axle	2485 kg (5467 lb)	2435 kg (5357 lb)
GPX 35	Drive Axle	2580 kg (5676 lb)	2805 kg (6171 lb)
	Steer Axle	2865 kg (6303 lb)	2815 kg (6193 lb)
GPX S40	Drive Axle	2635 kg (5797 lb)	2855 kg (6281 lb)
	Steer Axle	3100 kg (6820 lb)	3055 kg (6721 lb)
GPX 40	Drive Axle	2465 kg (5423 lb)	2690 kg (5918 lb)
	Steer Axle	3340 kg (7348 lb)	3290 kg (7238 lb)
GPX50	Drive Asle	2875 kg (6325 lb)	3215 kg (7073 lb)
	Steer Axle	3865 kg (8503 lb)	3765 kg (8283 lb)

Maximum Gradeability

At stall in forward with standard upright of 3120 mm (125 in) mfh *without load*:

	Single-Speed Transmission		Two-Speed Transmission	
	G/LPG	Diesel	G/LPG	Diesel
GPX 30	27.6 %	30.7 %	30.7 %	30.7 %
GPX 35	25.2 %	28.0 %	26.1%	28.9 %
GPX S40	25.8 %	28.7 %	28.7 %	28.7 %
GPX 40	25.8 %	28.7 %	28.7 %	28.7 %
GPX 50	24.6 %	27.3 %	27.3 %	27.3 %

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PM Report Form

A planned maintenance program of regular, routine inspections and lubrication is important for long life and trouble-free operation of your lift truck. Make and keep records of your inspections. Use these records to help establish the correct PM intervals for your application and to indicate maintenance required to prevent major problems from occurring during operation.

As an aid in performing and documenting your PM inspections, Clark has prepared a "Gas, LPG or Diesel Planned Maintenance Report" form. Copies of this form may be obtained from your authorized Clark dealer. We recommend that you use this form as a checklist and to make a record of your inspection and truck condition.

The periodic maintenance procedures outlined in this manual are intended to be used with the PM report form. They are arranged in groupings of maintenance work that are done in a logical and efficient sequence.

A check mark or entry is made on the PM Report Form when the PM is performed. Please note the special coding system for indicating the importance of needed repairs and/or adjustments.

When you have finished the PM inspections, be sure to give a copy of the report to the designated authority or the person responsible for lift truck maintenance.

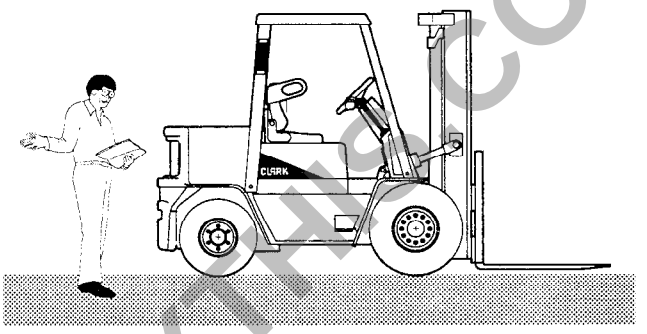
CAUTION

Do not make repairs or adjustments unless authorized to do so.

Disconnect the battery ground cable (-) from the engine or frame before working on electrical components. Always wear safety glasses. Wear a safety (hard) hat in industrial plants and in special areas where protection is necessary or required. Remove all jewelry (watch, rings, bracelets, etc.) before working on the truck.

Visual Inspection

First, perform a visual inspection of the lift truck and its components. Walk around the truck and take note of any obvious damage and maintenance problems. Check for loose fasteners and fittings.



Check to be sure all capacity, safety, and warning plates and decals are attached and legible.

NOTICE

Do not operate a lift truck with damaged or missing decals and nameplates. Replace them immediately. They contain important information.

Inspect the truck before and after starting engine for any signs of external leakage: fuel, engine oil or coolant, transmission fluid, etc.

Check for hydraulic oil leaks and loose fittings. DO NOT USE BARE HANDS TO CHECK. Oil may be hot or under pressure.

CAUTION

Hydraulic Fluid Pressure. Do not use your hands to check for hydraulic leakage. Fluid under pressure can penetrate your skin and cause serious injury.

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		Planned Maintenance
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00	2	Diesel Workshop Manual
00	3	Gas/LPG Workshop Manual
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01	1	Troubleshooting
01	2	Cooling System Testing and Maintenance
01	3	Fan Belt Replacement
01	4	Radiator Removal
02		**FUEL SYSTEM**
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02	2	The IMPCO Fuel System
02	3	Carburetor Overhaul
02	4	Velocity Governor Overhaul
02	5	Removal of IMPCO Vaporizing System
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20	3	Axle Ends Overhaul
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22	2	Wheels and Tires Mounting

(continued on next page)

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This publication has been written for gasolene (petrol), natural gas and LPG (liquid petroleum gas) engines. Any information required on LPG engines which is not to be found in this publication, such as, starting procedure, gas pressure reducing equipment, pre-heating and carburation etc., should be obtained from the manufacturer of the machine or his supplier.

Perkins Engines Limited is not responsible for any damage caused to this engine or its component parts by fitting of any LPG or natural gas conversion equipment not approved by the Company or which is incorrectly fitted or adjusted.

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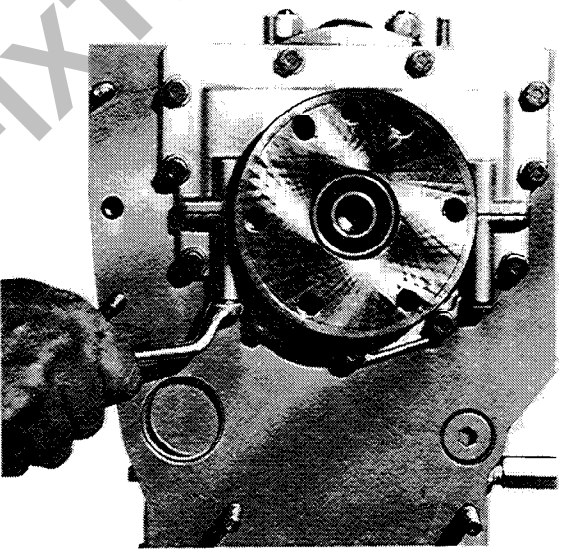
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use any convenient round bar to further bed in the strip by rolling and pressing its inner diameter. (Fig. H.7).
This procedure takes advantage of the friction between the strip and the groove at the ends, to compact the rope, whilst ensuring that the projections of the end faces of the rope remain as set.

4. Fit seal to other half housing in a similar manner.
5. Fit new joint treated with a suitable jointing compound to cylinder block and bridge piece.
6. Coat joint faces of the housing with suitable jointing compound.
7. Smear a film of graphited grease over the exposed inside diameter surface of the strip.
8. Coat the half housing butt faces with jointing compound.
9. Oil the crankshaft rear end oil return groove.
10. Place the half housings in position on the engine and locate all setscrews finger tight only.
11. Tighten the clamping bolts to a torque of only 4 to 6 lbf ft (0.55/0,83 kgf m).
12. Tighten the setscrews in the cylinder block and bridge piece to a torque of 12 lbf ft (1,66 kgf m).
13. Finally tighten clamping bolts to a torque of 12 lbf ft (1.66 kgf m). (Fig. H.8).



H7



H8

Crankshaft Rear End Oil Seal (Lip Type)

Later engines are fitted with a circular spring loaded lip seal that locates around the periphery of the flange of the crankshaft. The seal is designed to function correctly with the direction of rotation of the engine and for identification purposes the seal is marked with an arrow.

The lip type oil seal assembly and its counterpart crankshaft are not interchangeable with previous types.

This seal is easily damaged and extreme care should be taken when handling and fitting it. Any visual damage across the lip of a new seal will cause leakage and prevent bedding in of the seal.

Earlier seals have a flat rear face as shown in Fig. H.9. Later seals have a protruding dust lip from the rear face as shown in Fi.g H.10.

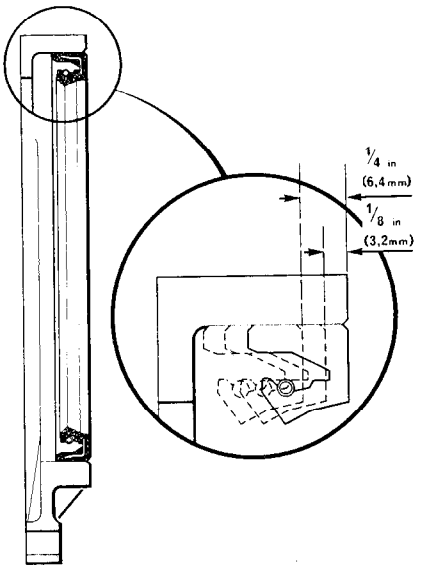
To Fit Lip Seal in its Housing

On production, the old type seal was fitted flush with the rear face of the housing (Fig. H.9) but the new type seal is fitted deeper into the housing at 'A', Fig. H.10.

In service, when a new seal is fitted to a worn crankshaft, it should be pressed further into the housing. In the first instance it can be pressed in to 1/8 in (3,2 mm) for old type seals or position 'B' for new type seals or, if this position has been used, to 1/4 in (6,4 mm) for old type seals or position 'C' for new seals.

If a new type seal is used in place of an existing old type seal, position 'C' should be used if the old seal was fitted 1/8 in (3,2 mm) below the housing face.

If all three positions have been used, it may be permissible to machine the worn sealing area of the crankshaft flange (See Page H.3).



H9

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To Remove Flywheel Housing

1. Remove flywheel.
2. Unscrew nuts and setscrews securing flywheel housing to cylinder block and tap the housing clear of the locating dowels.
3. Examine housing for cracks and damage etc.

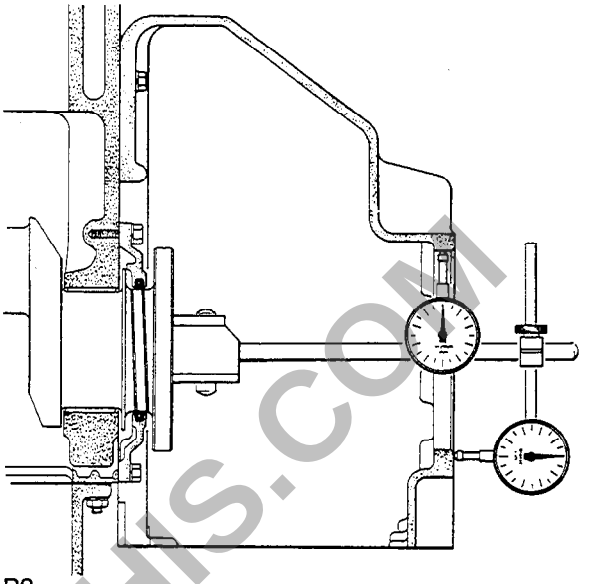
To Refit Flywheel Housing

1. Remove locating dowels and fit housing to cylinder block.
2. Refit securing nuts or setscrews.
3. Check concentricity (Fig. P.2). The inner bore of the flywheel housing must be truly central with the crankshaft within the limits listed below.
4. Check perpendicular alignment (Fig. P.2). This facing should be within the limits listed below.

Diameter of Housing	Allowance
Up to 14¼ in (362 mm)	0.006 in (0,15 mm) T.I.R.
14¼ to 20⅛ in (362 to 511,18 mm)	0.008 in (0,20 mm) T.I.R.
20⅛ to 25½ in (511,18 to 647,70 mm)	0.010 in (0,25 mm) T.I.R.
25½ to 31 in (647,70 to 787,40 mm)	0.012 in (0,30 mm) T.I.R.

(T.I.R. Total Indicator Reading).

5. All adjustments to bring flywheel housing within the above limits must be carried out on the flywheel housing and NOT on the rear face of the cylinder block which must not be interfered with.
6. When housing is properly aligned to the above limits, tighten the securing nuts evenly.
7. Ream dowel holes and fit correct length and size dowels.
8. Refit flywheel.



P2

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Basic engine data 11A

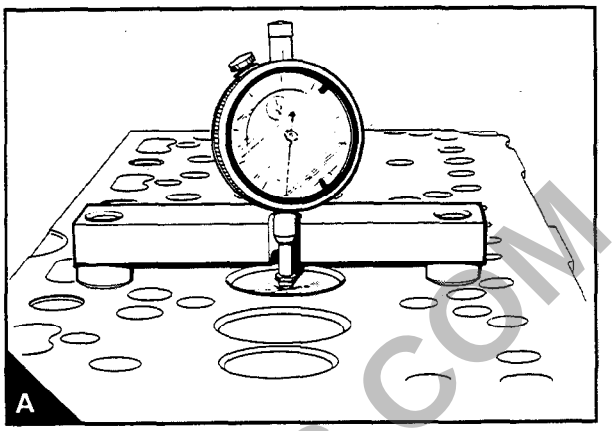
Basic engine data 11A.02

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To inspect and to correct 12A-09

Special tool:
Gauge, valve depth, PD.41D
Dial gauge for use with PD.41D, PD.208



1 Check the depth of the valves below the face of the cylinder head before the valve springs are removed. Ensure that the heads of the valves and the bottom face of the cylinder head are clean. Put the valve depth gauge on the face of the cylinder head and zero the dial gauge. Carefully put the valve depth gauge in position over the head of each valve (A) and make a note of the measurement. The maximum valve depth, in service, is given in section 11C. If a valve is below the depth limit, check the valve depth with a new valve in position. If the valve depth is still below the limit and a valve seat insert is fitted, the insert must be renewed. Where a valve seat insert is not fitted, the bottom face of the cylinder head can be machined to reduce the valve depth, or an insert can be fitted, operation 12A-14.

2 Check the valves for cracks. Check the stems of the valves for wear and for correct fit in their valve guides.

3 Check that the seat faces of the valves are not badly burnt or damaged. Seat faces of valves which are damaged can be ground on a special machine. Valves which have only little damage can be lapped to their valve seats. When new valves are fitted, the valve depths must be checked, see paragraph 1.

4 Check that the load on the valve springs is correct at their fitted length, see section 11C.

Fit new valve springs at every complete engine overhaul.

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Crankshaft gear

To remove and to fit **15A-06**

To remove

1 Remove the fan, operation 21A-04.

2 Remove the drive belts, operation 23A-03.

3 Remove the crankshaft pulley, operation 14-01.

4 If necessary, remove the fan drive pulley, operation 21A-05.

5 Drain the coolant and remove the water pump, operation 21A-02.

6 Remove the timing case cover, operation 15A-01.

7 Turn the crankshaft until the marked teeth of the crankshaft gear, the camshaft gear and the fuel pump gear are all in mesh with the idler gear. The marked teeth of the idler gear will not necessarily be in mesh with the marked teeth of the other gears because of the different speed of rotation of the idler gear.

Note: The fuel pump gear used on engine types AE and YE does not have marked teeth.

8 Remove the idler gear, operation 15A-03.

9 The crankshaft gear is a transition fit on the crankshaft. It may slide off easily or, if it is a tight fit and the gear is to be renewed, it may be necessary to remove the crankshaft, operation 14A-08, to remove the gear safely.

To fit

1 The gear can fit easily, or it may be necessary to heat the gear before it will fit onto the crankshaft. If the gear is to be heated, heat it in an oven to not more than 180°C (226°F). If an oven is not available, heat it in water which is at its boiling point. Do not use a flame as this can cause local damage. Fit the gear with the timing marks to the front.

2 Fit the idler gear, operation 15A-03 and ensure that all the timing marks are correctly aligned.

3 Fit the timing case cover, operation 15A-01

4 Fit the water pump, operation 21A-02.

5 Fit the crankshaft pulley, operation 14A-01.

6 If necessary, fit the fan drive pulley, operation 21A-05.

7 Fit the drive belts, operation 23A-03 and adjust the belt tension, operation 23A-02.

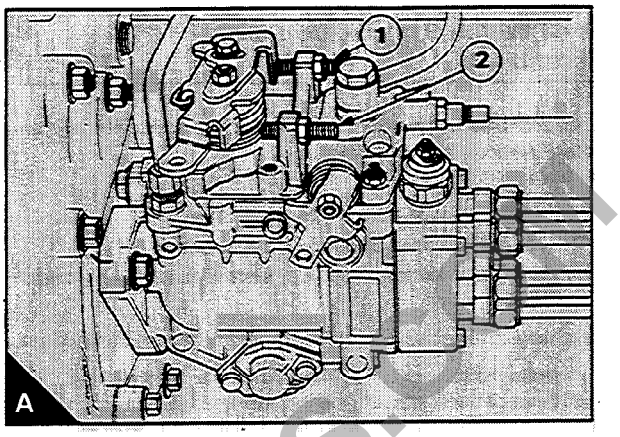
8 Fit the fan, operation 21A-04.

9 Fill the cooling system.

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To adjust - Bosch pump 20A-07A



1 Operate the engine until it reaches its normal temperature of operation and check the idle speed. If necessary, adjustment can be made by the inner adjustment screw (A1). Release the locknut and turn the screw clockwise to increase the speed, or counter-clockwise to decrease the speed. When the speed is correct, tighten the locknut. The setting of the idle speed can change for different applications. The correct speed will normally be given in the manufacturer's handbook for the application. If it is not given, apply to your nearest Perkins distributor or to Technical Services Department, Perkins Engines, Peterborough, England.

2 With the engine at its normal temperature of operation, check the maximum no load speed. The maximum no load speed is indicated by the last section of the setting code for the fuel injection pump. The setting code can be found on the data plate on the side of the fuel pump. A typical setting code is 2643J000CK/1/2960. In this example, the maximum no load speed is 2960 rev/min. If necessary, this speed can be adjusted by the outer adjustment screw (A2). Release the locknut and turn the screw counter-clockwise to increase the speed or clockwise to decrease the speed. When the speed is correct, tighten the locknut and seal the screw. The person who fits the pump must ensure that the adjustment screw is suitably sealed against interference after it has been set initially.
The adjustment screw on original fuel pumps is set and sealed by the manufacturer. The setting must not be changed as this could affect the engine warranty.

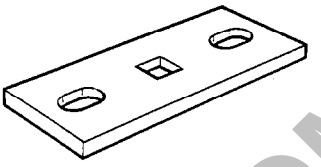
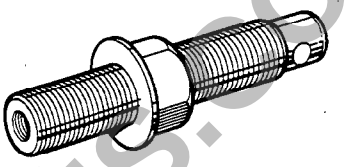
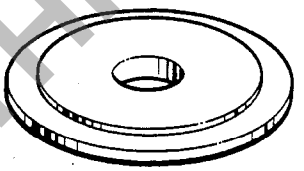
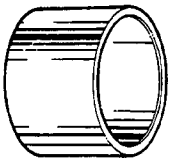
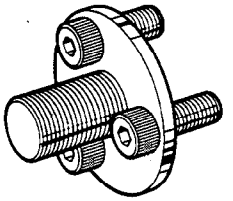
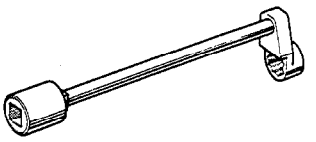
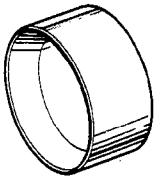
To adjust - CAV pump 20A-07B

1 Operate the engine until it reaches its normal temperature of operation and check the idle speed. If necessary, adjustment can be made by the inner adjustment screw (20A.10/A2). Release the locknut and turn the screw clockwise to increase the speed or counter-clockwise to decrease the speed. When the speed is correct, tighten the locknut. The setting of the idle speed can change for different applications. The correct speed will normally be given in the manufacturer's handbook for the application. If it is not given, apply to your nearest Perkins distributor or to Technical Services Department, Perkins Engines, Peterborough, England.

2 With the engine at its normal temperature of operation, check the maximum no load speed. The maximum no load speed is indicated by the last part of the setting code for the fuel injection pump. The setting code can be found on the data plate on the side of the fuel pump. A typical setting code is 2643M000AK/1/2860. In this example, the maximum no load speed is 2860 rev/min. If necessary, this speed can be adjusted by the outer adjustment screw (20A.10/A3). Release the locknut and turn the screw counter-clockwise to increase, or clockwise to decrease, the speed. When the speed is correct, tighten the locknut and seal the screw. The person who fits the pump must ensure that the adjustment screw is suitably sealed against interference after it has been set initially.
The adjustment screw on original fuel pumps is set and sealed by the manufacturer. The setting must not be changed as this could affect the engine warranty.

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Number	Description	Illustration
PD.165B	Crankshaft rotation adaptor for use with a 25 mm (0.5 in) square drive.	
PD.170	Replacer tool for seal of timing case cover (main tool).	
PD.170-1	Pressure plate for use with PD.170.	
PD.170-2	Sleeve for use with PD.170.	
PD.170-3	Fastener plate for use with PD.170.	
PD.170-4 **PD.170-8**	Adaptor for standard seal for use with PD.170. Adaptor for water immersion seal for use with PD.170.	
PD.199	Spanner for flange nuts of fuel injection pump.	
PD.206	Replacer tool for piston.	

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9. Remove choke bracket screws, lockwashers and choke bracket (parts not shown).
10. Drive out shaft hole plug using a 6" length of 1/4" rod inserted through opposite shaft hole.
11. To remove choke shaft packing and retainer, screw a 5/16" fine thread tap into packing retainer until firmly seated, then insert long punch or rod through opposite shaft hole and drive punch against end of tap until retainer is free of air intake body. Remove retainer and packing from tap and repeat at opposite shaft hole.

Cleaning

Thoroughly clean all metal parts in carburetor cleaner and rinse in solvent. Blow out all passages and channels in the castings with compressed air. Reverse the air flow through each passage to insure the removal of all dirt particles. NEVER USE A WIRE OR DRILL TO CLEAN OUT THE JETS.

Inspection

Inspect all parts and replace any that are damaged or worn. Always us a Clark Repair Kit. For correct Repair Kit, refer to Parts Book Numbers. If inspection reveals that the fit of the throttle shaft is sloppy in the throttle body bushings, it will be necessary to install new throttle shaft bushings. The following procedure should be followed when installing throttle shaft bushings in the throttle body.

Removal and Replacement of Throttle Shaft Bushings

NOTE: To rebush the throttle body, it is necessary to have available the following Clark Tools as well as the new bushings and oversize plug:

863807-Counterbore Reamer

863804-Line Reamer

863805-Bushing Driver

910746-Throttle Shaft Bushings

910747-Oversize Plug

1. Place a suitable center in drill press bed. With one throttle shaft hole on this center, bring spindle down until counterbore reamer contacts opposite shaft hole; then set stop on drill press to length of bushing.
2. Counterbore hole to accommodate bushing, using 863807 Counterbore Reamer.
3. Drive throttle shaft bushing into place using 863805 Bushing Driver.
4. Ream this bushing, using 864804 Line Reamer. The opposite shaft hole is used as a "pilot" to align reamer in bushing.
5. Turn throttle body casting over and prepare opposite hole to take bushing. It will be necessary to reset stop on spindle again as described above. Counter bore hole, using 863807 Counterbore Reamer.
6. Drive second throttle shaft bushing into place, using 863805 Bushing Driver.
7. Line ream this bushing as the final machining operation, using 863804 Line Reamer.
8. After the new throttle shaft bushings are in place it will be necessary to redrill the economizer restriction located in cover section and the channel from the throttle body bore into the throttle shaft hole.

To drill the channel from the throttle body bore into the throttle shaft hole it will be necessary to remove the brass channel plug in the throttle body. This can be drilled out using a 3/32" drill. A new "oversize" plug (No. 910747) should be installed after the drilling operation is completed.

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31. Remove the intermediate shaft retainer ring on the axle adaptor end of the transmission.

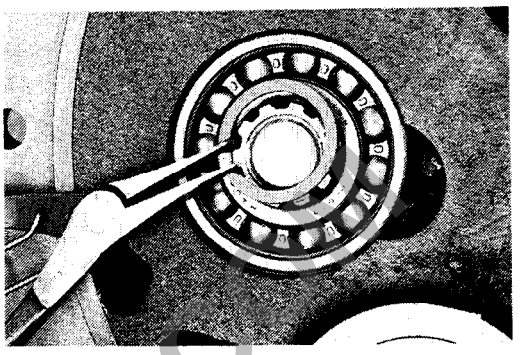


Fig. 10098

32. Remove the intermediate gear retainer ring from the retainer slot and slide to the position as shown.

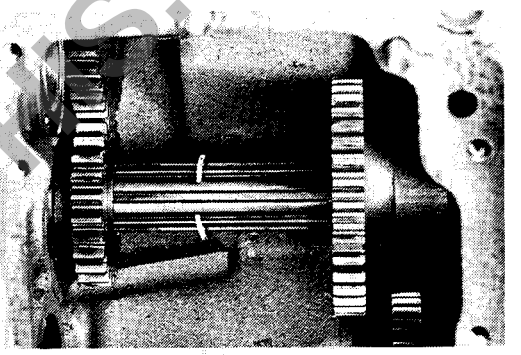


Fig. 10240

33. Use a brass drift to move the intermediate shaft toward the cover end about four inches.

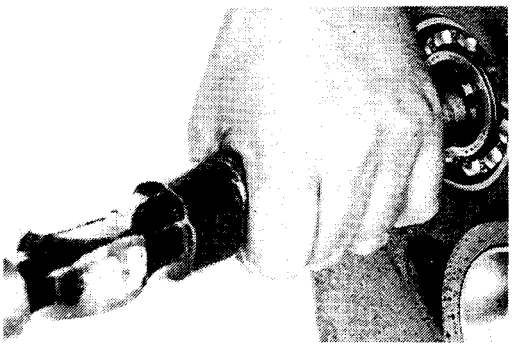


Fig. 10099

34. Remove the intermediate gears and retainer rings by sliding them off the shaft.

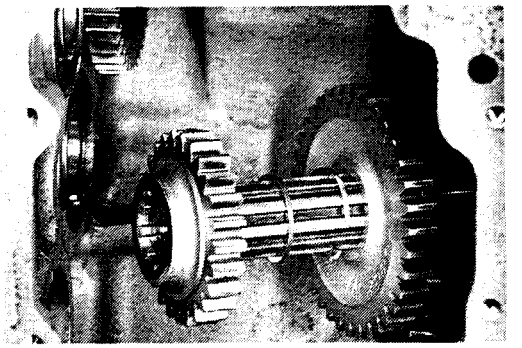


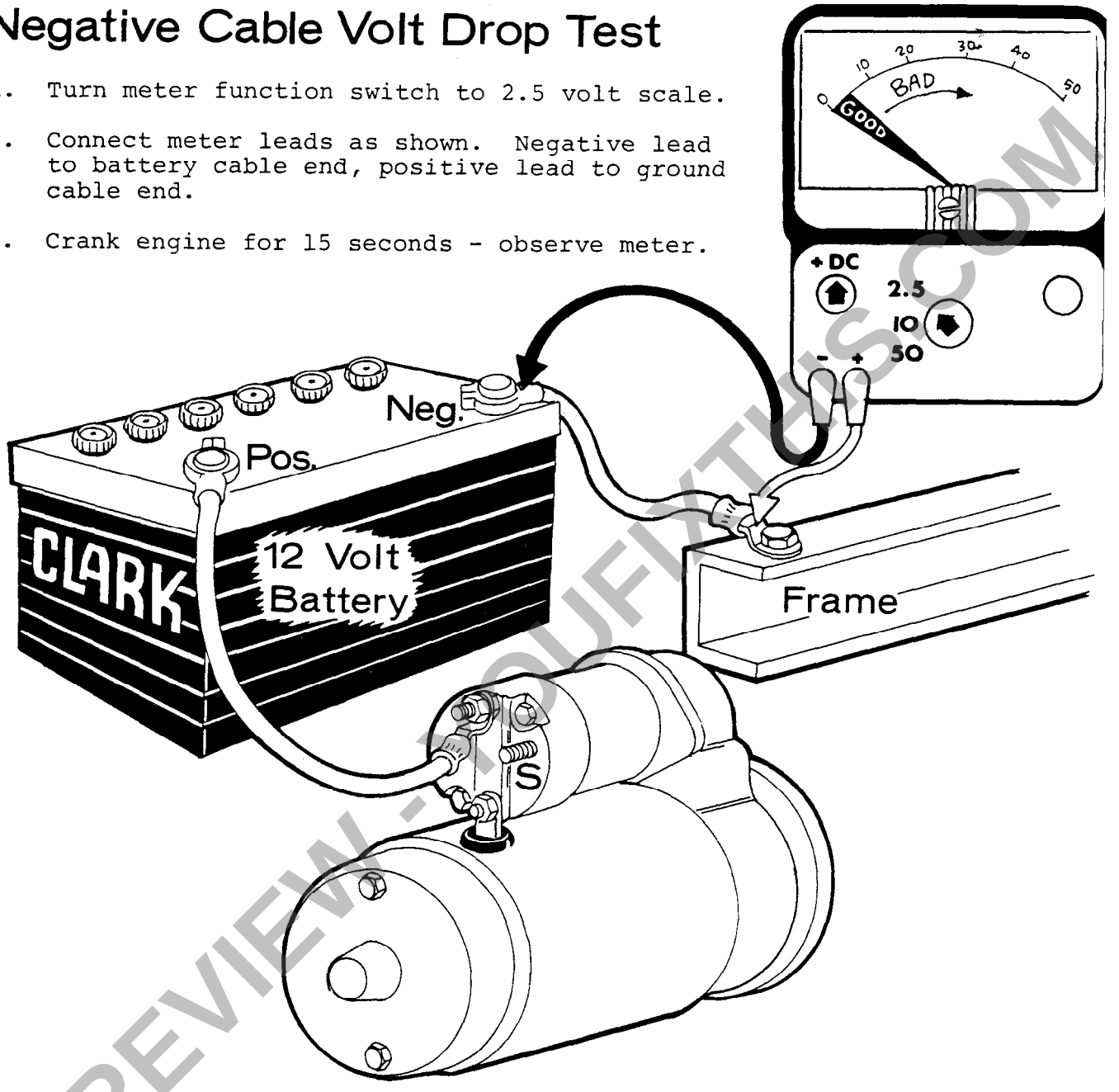
Fig. 10241

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Negative Cable Volt Drop Test

1. Turn meter function switch to 2.5 volt scale.
2. Connect meter leads as shown. Negative lead to battery cable end, positive lead to ground cable end.
3. Crank engine for 15 seconds - observe meter.



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RESULTS

A. Voltage reading up to .4 volts ...cable is good.

B. Voltage reading above .4 volts ...indicates bad cable or cable connection.

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Safe Handling of Split Rim Wheels

DANGER

For your safety and the safety of others, before you do tire or rim maintenance, read the OSHA rules regarding user responsibility. Do not work on tires or rims unless you have been trained in the correct procedures. Read and understand all maintenance and repair procedures on tires and rims. Serious injury or death can result if the safety messages are ignored.

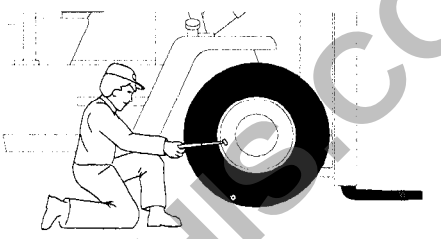
The Occupational Safety and Health Act (OSHA) specifies required procedures for servicing multi-piece rim wheels in 29 CFR Section 1910.177. It is the owners responsibility to comply with OSHA.

In accordance with OSHA, the owner must provide a training program to train and instruct all employees who service multi-piece rim wheels in the hazards involved and the safety procedures to be followed. Do not let anyone mount, demount or service multi-piece rim wheels without correct training.

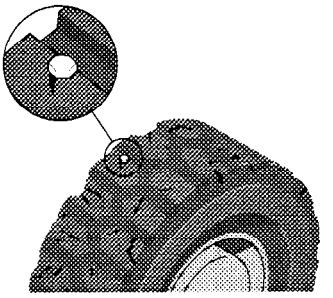
The owner should obtain and maintain in the service area current copies of the United States Department of Transportation, National Highway Traffic Safety Administration publications entitled "Safety Precautions for Mount and Demounting Tube-Type Truck/Bus Tires" and "Multi-Piece Rim/Wheel Matching Chart" or other similar publications applicable to the types of multi-piece rim wheels being serviced.

The following instructions supplement the OSHA requirements. In the event of any conflict or inconsistency between these instructions and the OSHA requirements, the OSHA requirements shall be controlling.

1. When checking tire pressure always use a long handled tire gauge and stay to one side.

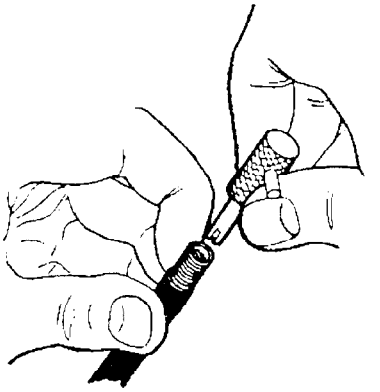


2. Check wheels and tires for damage every time you check tire pressure. Make repairs when needed. Dirt can get into cuts and cause damage to the tire tread. Remove debris from all cuts.



DANGER

Before you loosen the wheel mounting bolts or nuts, remove the air from the tire. Failure to remove the air from the tire can result in injury.



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Problem	Possible Cause	Correction
13. Steering unit locks up.	Large particles in meter section.	Clean the unit.
	Insufficient hydraulic power (units over 15 in^3).	Check hydraulic power supply.
	Severe wear and/or broken pin.	Replace the unit.
	*Thermal shock.	Replace the unit.
14. Steering wheel oscillates or turns by itself.	Parts assembled wrong. Steering unit improperly timed.	Correct timing.
	Lines connected to wrong ports.	Reconnect lines correctly.
15. Steered wheels turn in wrong direction when operator activates steering wheel	Lines connected to wrong cylinder ports.	Reconnect lines correctly.
16. Steering wheel kicks at start of steering.	No inlet check valve on steering control unit.	Install a check valve.
17. Instability—Load Sensing Systems. Hoses jump, severe vibration in hydraulic system, noise in hydraulic system, vehicle vibration when steering is activated.	Air in lines	Check pump inlet. Bleed sensing lines.
	Harmonic system	Add hose or an accumulator.
	Plumbing	Bleed all lines. Pilot lines should be tubing. lines to cylinder should be tubing. If 2 pilot lines are used go to 1.
	Relief Setting	Pump relief should be 300 PSI above priority relief.
	Priority Valve	Bleed by holding against stop for 30 seconds on models w/built in relief only.
		Decrease damping orifice by adding small wire.
		Increase spring rate (this will raise the standby pressure).
	Load Sensing Pump	Compensator sticky. Increase standby pressure.

*Thermal shock—A condition caused when the hydraulic system is operated for some time without turning the steering wheel so that fluid in the reservoir and system is hot and the steering control unit is relatively cool (more than 50° F temperature differential). When the steering wheel is turned quickly the result is temporary seizure and possible damage to internal parts of the steering control unit. The temperary seizure may be followed by total free wheeling.

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Section 1.

Hydraulic Sump and Filters

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Troubleshooting

CONDITION	POSSIBLE CAUSE	SUGGESTED CORRECTION
No lift, tilt or auxiliary function.	1. Hydraulic fluid level low. 2. Hose broken. 3. Hydraulic pump defective. 4. Defective main lift valve. 5. Defective flow control valve. 6. Defective priority valve (flow control valve).	1. Check for correct fluid level. 2. Replace hose. 3. Repair or replace hydraulic pump. 4. Replace main lift valve. 5. Overhaul or replace flow control valve. 6. Overhaul or replace priority valve (flow control valve).
Load cannot be lifted to maximum height.	1. Hydraulic fluid level low. 2. Hydraulic pump defective. 3. Upright rails binding.	1. Check fluid level. Fill as required. 2. Repair or replace hydraulic pump. 3. Make upright adjustments.
Oil leak at top of lift cylinder.	1. Worn or damaged lift piston seal. 2. Scored cylinder wall. 3. Plugged vent line.	1. Replace seal. 2. Repair or replace cylinder. 3. Clean or replace vent line.
Unsatisfactory lift or tilt cylinder drift test results.	1. For lift cylinder: Control valve spool linkage malfunctioning, damaged, or worn. 2. For tilt cylinders: Tilt lock valve malfunctioning, damaged, or worn.	1. Inspect, overhaul, or replace spool linkage. 2. Inspect, overhaul, or replace tilt lock valve.
Lift speeds sluggish.	1. Hydraulic fluid level low. 2. Hose broken. 3. Hydraulic pump defective. 4. Defective main lift valve. 5. Defective flow control valve. 6. Defective priority valve (flow control valve).	1. Check for correct fluid level. 2. Replace hose. 3. Repair or replace hydraulic pump. 4. Replace main lift valve. 5. Overhaul or replace flow control valve. 6. Overhaul or replace priority valve (flow control valve).

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ROLLER AND ROLLERLESS CHAIN

Rollerless Chain No.	Roller Chain No.	Pitch	Span	Worn Chain Length
40	45	[12,70 mm] 0.500 inch	25	[314,32 mm] 12.375 inch
50	55	[15,87 mm] 0.625 inch	21	[327,02 mm] 12.875 inch
60	65	[19,05 mm] 0.750 inch	17	[314,32 mm] 12.375 inch
80	85	[25,40 mm] 1.000 inch	13	[314,32 mm] 12.375 inch
100	105	[31,75 mm] 1.250 inch	11	[327,02 mm] 12.875 inch
120	125	[38,10 mm] 1.500 inch	9	[314,32 mm] 12.375 inch
140	145	[44,45 mm] 1.750 inch	8	[320,67 mm] 12.625 inch
160	165	[50,80 mm] 2.000 inch	7	[314,32 mm] 12.375 inch
200	205	[63,50 mm] 2.500 inch	6	[327,02 mm] 12.875 inch

LEAF CHAIN

Chain No.	Pitch	Span	Worn Chain Length
BL400	[12,70 mm] 0.500 inch	25	[314,32 mm] 12.375 inch
BL500	[15,87 mm] 0.625 inch	21	[327,02 mm] 12.875 inch
BL600	[19,05 mm] 0.750 inch	17	[314,32 mm] 12.375 inch
BL800	[25,40 mm] 1.000 inch	13	[314,32 mm] 12.375 inch
BL1000	[31,75 mm] 1.250 inch	11	[327,02 mm] 12.875 inch
BL1200	[38,10 mm] 1.500 inch	9	[314,32 mm] 12.375 inch
BL1400	[44,45 mm] 1.750 inch	8	[320,67 mm] 12.625 inch
BL1600	[50,80 mm] 2.000 inch	7	[314,32 mm] 12.375 inch

PITCH - The distance from the center of one pin to the center of the next pin.

SPAN - The number of pins in the length of chain to be measured.

WORN CHAIN LENGTH - The distance from the first pin counted to the last pin counted in a span while the chains have lifted a small load.

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